EM477 - Computer-Aided Design
Rocker Mechanism Design Project - Final Report Requirements

Each team is required to submit a formal final report that fully documents the function, operation, limitations and design of your rocker mechanism. The report should contain sufficient detail so that your mechanism could be manufactured based on the information in the report. Refer to the *Format and Style Guide for Technical Reports* for information about formatting the report.

It is highly recommended that your report contain the following:

Title Page - Name of project and team members

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Abstract or Executive Summary

Introduction - This section should include a problem statement along with design specifications. You should explain how you selected particular specifications such as precision points, required coupler rotation and speed of operation.

Description of the Mechanism - Describe any preliminary candidate designs that were investigated prior to selecting the final design. The final mechanism should be described in detail, explaining how it operates and how it meets the design specifications. This should include:

- an animation produced in I-DEAS that shows the mechanism moving through its range of motion (indicate the name and account of the I-DEAS model file containing the animation an the appropriate sequence number for the animation)
- MathCAD plots of the position of precision points over the range of motion (coupler curves) may also be helpful to describe the operation of the mechanism. (Your memo report, submitted earlier in the semester, should contain this information.)

Mechanism Analysis - The mechanism should be analyzed over its complete range of motion to determine the configuration of the assembly at several intermediate positions.

- All assumptions regarding the motion of the mechanism should be clearly stated and justified.
- The force or torque required to actuate the mechanism should be plotted as a function of time. The ground reactions and pin forces should also be determined over the full range of motion to decide upon the worst case loading conditions. Use I-DEAS to perform the analysis. (In order to get accurate results for the inertial forces, you must specify the material of each component of your mechanism in I-DEAS so that it can compute masses properly. Be sure to include "gravity" as an applied acceleration so that the weight of the components is properly accounted.) Manually adjust the weight of the seat bottom of the chair assembly so that it weighs 200 lb. to simulate the weight of a person.

Stress Analysis - The results of the I-DEAS force analysis should form the basis for the stress analysis of the individual components of your mechanism. You should demonstrate

through calculations whether or not the various elements of your mechanism have sufficient strength to safely handle the externally applied loads and the inertial forces that develop in the mechanism. In the body of the report, you should briefly describe the analysis and assumptions used in analyzing each part and perhaps summarize the maximum stress level in each part. The detailed strength of materials calculations should not appear in the main body of the report but should be presented in Appendices. (Make sure you refer the reader to look at the appendices for the stress analysis details.) The calculations should contain sufficient information so that someone could verify your approach, your assumptions and your conclusions. The design calculations may be in the form of hand calculations or computer-aided calculations such as spreadsheets, MathCAD or EES. Make sure that any computer calculations are backed up by free-body diagrams or other sketches that support the calculations.

As a minimum, you should analyze the shear stress developed in the pins and ensure that the links will not fail due to tear-out.

Economic Analysis - You should provide an estimate of the cost to manufacture your mechanism. A Bill of Materials, listing every piece of your assembly serves as a good starting point. State any assumptions that you make concerning the cost of labor and the time required to manufacture your device.

Prototype Performance - Describe your prototype mechanism and discuss the performance of the prototype compared with the design specifications. Some questions to consider:

Did your prototype meet the required specifications?
How well did your mechanism reproduce the motion of the Boston rocker?
How could it be improved?

Summary - Summarize what was done in this project and make recommendations for improving the design.

Grading - A grade will be assigned to your report based on the following areas: completeness, technical accuracy, originality in your design and overall appearance. The project report is worth 20% of your semester grade. A copy of the report grading sheet is attached for your information. The report is due by close of business on Thursday, 13 DEC 01.

Cost Information for Rocker Parts

Item	**Cost**
3/4 x 1/8 Aluminum Angle - 16 ft. length	$8.95
3/4 x 1/8 Aluminum bar - 12 ft. length	$4.42
10-32 Phillips Head Machine Screw	$0.03
10-32 Keps Nut	$0.03
3/8” O.D. Spacer	$0.40
Flat Washer	$0.01
Pop Rivets	$0.01
Motor and Mount Assembly	$35.00

EM477 ROCKER MECHANISM PROJECT GRADING

I. Introduction	/10
Problem Statement	
Specifications	
What are they	
Why selected	
II. Description	/20
Preliminary Designs	
Operation	
Meet Design Specs	
Adequate Range of Motion	
Animation	
III. Analysis	/20
Forces and Torque	
Range of Motion Results	
IV. Stresses	/20
Part Size/Shape	
Stress Levels	
V. Economic Analysis	/5
Bill of Materials	
Material Cost	
Fabrication Cost	
Labor Cost	
VI. Prototype Performance	/10
VII. Summary	/5
VII. Format	/10
Neatness	
Spelling	
Grammar/Style	
TOTAL	/100